

**City of Antioch  
Proposition 1E Grant Proposal  
Attachment 9**

**Water Quality and  
Other Expected Benefits**





**City of Antioch**  
**Proposition 1E Stormwater Flood Management Grant Proposal**

**ATTACHMENT 9 –**  
**WATER QUALITY AND OTHER EXPECTED BENEFITS**

This attachment describes the water quality and other expected provided by the *Drainage Area 55 – West Antioch Creek Channel Improvements Project*. In accordance with the PSP, the following details are provided:

**PSP Requirements**

- ✓ Narrative discussion of the estimates of without-project physical conditions **(see pg 9-3)**
- ✓ Narrative discussion of the estimates of with-project physical conditions **(see pg 9-4)**
- ✓ Description of methods used to estimate without- and with-project conditions **(see pgs 9-3 through 9-6)**
- ✓ Description of potential other benefits **(see pgs 9-4 through 9-5)**
- ✓ Description of the distribution of local, regional, and statewide benefits **(see pg 9-5)**
- ✓ Identification of beneficiaries **(see pg 9-5)**
- ✓ When benefits will be received **(see pg 9-5)**
- ✓ Uncertainty of benefits **(see pg 9-5)**
- ✓ Description of any adverse effects **(see pg 9-6)**

The following sections present a summary of the water quality and other expected benefits for the *Drainage Area 55 – West Antioch Creek Channel Improvements Project*.

**Overview**

The City of Antioch is partnering with the Contra Costa County Flood Control District (District) to address chronic flooding of West Antioch Creek through the installation of three 14' by 7' Caltrans Standard Box Culverts spanning 620 feet. These box culverts will increase the storm water capacity of the creek, replacing an inadequate concrete trapezoidal ditch and arch culverts. This installation will provide a 25-year level of flood protection (the maximum achieved without expanding the AT&SF RR crossing) to commercial and multi-family properties adjacent to the channel and within a Disadvantaged Community (DAC) by addressing a gap that currently exists between channel improvements made by the Contra Costa County Flood Control & Water Conservation District in 1993 and the earthen channel on the Antioch Fairgrounds property.

This project will (1) **improve flood protection** for the community, including disadvantaged communities (DACs); (2) **eliminate the significant public health threat** to this Disadvantaged Community (DAC) caused by chronic flooding and exposure to constituents of concern in degraded flood waters; (3) **provide water quality and habitat protection benefits** by reducing flood-related debris and pollutant loading in West Antioch Creek, which flows directly into New York Slough, and (4) **provide recreation benefits**, as flooding in this area often results in the closure of the Contra Costa County Fairgrounds, the Antioch Little League Complex and Prosserville Park.

The *Drainage Area 55 – West Antioch Creek Channel Improvements Project* is a stand-alone project, and does not depend upon other projects in this Proposal to provide the benefits described. A summary of all benefits and costs of the project are provided in Table 1.

**Table 1. Benefit-Cost Analysis Overview**

	<b>Present Value</b>
<u>Costs</u> – Total Capital and O&M	\$4,816,752
<u>Monetizable Benefits</u>	
Flood Control Benefits: Avoided losses in property damages, Avoided clean-up costs, Avoided traffic delays due to key road inundation (FRAM)	\$7,876,005
Total Monetized Benefits	\$7,876,005
<u>Qualitative Benefit or Cost</u>	<b>Qualitative indicator*</b>
Water Quality and Other Benefits	
Improved Public Health Protection	++
Improved Surface Water Quality	++
Avoided Loss of Recreation	++
Reduced Street Maintenance Costs	++
Flood Benefit	
Avoided Emergency Response Costs	++
O&M = Operations and Maintenance	
* Direction and magnitude of effect on net benefits:	
+ = Likely to increase net benefits relative to quantified estimates.	
++ = Likely to increase net benefits significantly.	
– = Likely to decrease benefits.	
– – = Likely to decrease net benefits significantly.	
U = Uncertain, could be + or –.	

### **Description of Without-Project Conditions**

Without the project, annual flooding events and the associated impacts (described below) will continue to plague the businesses and residents located in the project area, which happens to be a DAC. The following impacts have been documented by City of Antioch staff:

**Impaired Function During Storm Events.** This area currently experiences two to three floods annually, causing damage to local buildings and infrastructure. Additionally, during the flooding events considerable loss of function occurs. Local businesses are inaccessible, resulting in loss of revenue. The Pittsburg-Antioch Highway, which serves as a major transportation artery to and from East Contra Costa County, is often forced to close during these events, as are several recreational areas, including the Costa County Fairgrounds, the Antioch Little League Complex and Prosserville Park. These floods also result in the loss of the ability to provide the community with essential city services due to impacts to the City's Maintenance and Service Center.

**Public Health Issues Associated with Flooding.** Currently, during flooding events, water breaches the channel bank and travels through this DAC, collecting and depositing surface debris (trash, vegetation, etc.), pollutants (oil, pesticides, fertilizers, etc.), and pathogenic microorganisms. Direct contact with polluted flood waters through wound infections, dermatitis, conjunctivitis, and ear, nose and throat infections poses a significant risk of infection. One epidemic-forming disease that may be contracted from body contact with flood waters is leptospirosis, a bacterial disease, which may be transmitted through contact of the skin or mucous membranes with contaminated water, damp soil or vegetation or mud contaminated with rodent urine. Ingestion of flood waters or of water contaminated with flood waters poses a risk of severe infection. For communities plagued by chronic flooding, avoiding contact with flood waters may be impossible. Without the project, this disadvantaged community will continue to experience frequent flooding, and will continue to be regularly exposed to the real and immediate public health risks posed by degraded flood water quality.

**Delta Water Quality Impacts.** In addition to water quality impacts to the local community, Delta water quality is currently impacted by flooding issues in the project area. When impaired floodwaters recede, debris and pollutants make their way back into West Antioch Creek, which flows into the Sacramento – San Joaquin Bay – Delta upstream of New York Slough. Additional debris and pollutants are left behind, either to be cleaned by the DAC or absorbed into the local environment.

### **Description of Expected Water Quality and Other Benefits (With-Project Conditions)**

Implementation of the *Drainage Area 55 – West Antioch Creek Channel Improvement Project* will provide a variety of water quality and other benefits, including improved surface water quality, improved public health protection, avoided loss of recreation, and reduced street maintenance costs. These qualitative benefits are listed in Table 2 and described in greater detail below.

**Table 2 Qualitative Benefits Summary – Water Quality and Other Benefits**

Benefit	Qualitative Indicator*
Improved Public Health Protection	++
Improved Surface Water Quality	++
Avoided Loss of Recreation	++
Reduced Street Maintenance Costs	++

\* Direction and magnitude of effect on net benefits:

+ = Likely to increase net benefits relative to quantified estimates.

++ = Likely to increase net benefits significantly.

– = Likely to decrease benefits.

– – = Likely to decrease net benefits significantly.

U = Uncertain, could be + or –

### ***Public Health Protection Benefits***

In addition to improving surface water quality in the Delta, the project will improve public health protection by eliminating exposure to degraded flood waters. Currently, this community experiences moderate to severe flooding two to three times per year. According to the World Health Organization (WHO), there is an increased risk of infection of waterborne diseases when direct contact occurs with polluted flood waters through wound infections, dermatitis, conjunctivitis, and ear, nose and throat infections. One epidemic-forming disease that may be contracted from body contact with flood waters is leptospirosis, a bacterial disease. Leptospirosis may be transmitted through contact of the skin or mucous membranes with contaminated water, damp soil or vegetation or mud contaminated with rodent urine. Flooding following rainfall assists in spreading the organism due to the proliferation of rodents which shed large amounts of leptospires in their urine. Leptospirosis outbreaks have occurred throughout the world, with a recent (2007) outbreak on a college campus in Oahu, HI following a flood event.

Ingestion of flood waters, or of water contaminated with flood waters, can cause a host of infections, ranging from mild to severe. A well-known example of disease outbreak following drinking water contamination occurred in Walkerton, Ontario in 2000 in which seven people died after consuming drinking water contaminated with E. Coli. In 1999, a dormitory sewage pit on County Fairgrounds in New York caused a major outbreak of waterborne disease, killing two people and hospitalizing 71 others.

The risk of infection posed by contacting and / or ingesting flood waters is severe. For communities plagued by chronic flooding, avoiding contact with flood waters may be impossible. This project will protect this disadvantaged community from floods up to the 25-year event, all but removing the real and immediate public health risks posed by degraded flood water quality.

### ***Surface Water Quality Protection Benefits***

Implementation of this project will reduce flood-related debris and pollutant loading in West Antioch Creek. West Antioch Creek flows directly into New York Slough, which leads to Suisun Bay and the Sacramento-San Joaquin Delta. Beneficial uses in New York Slough (included in the revised Basin Plan) are: commercial and sport fishing, estuarine habitat, fish migration, preservation of rare and endangered species, wildlife habitat, water contact recreation, non-contact water recreation, and navigation. Flood-related loading would incrementally contribute to further surface water quality degradation in New York Slough, Suisun Bay, and the Delta. Specific constituents of concerns include chlorides and mercury.

### ***Other Benefits***

Other benefits of this project include avoided loss of recreation and reduced street maintenance costs.

#### Avoided Loss of Recreation

Flooding often results in the closure of the Contra Costa County Fairgrounds, the Antioch Little League Complex and Prosserville Park. Implementation of this project will reduce the frequency of closure at these facilities, and the associated loss of recreation.

### Reduced Street Maintenance Costs

As floodwaters recede, a significant volume is left behind in temporary ponds. The project will reduce ponding on streets and minimize the effect of moisture in creating potholes and cracks, which make up a significant portion of street maintenance costs.

### ***Project Beneficiaries and Distribution of Benefits***

The proposed project includes the full range of beneficiaries, as summarized in Table 3. At the local level, the DAC residents that live and work in the area will benefit from the improved surface water quality and public health protection as well as the reduced risk of flood-related damage. At the regional level, the City of Antioch and its residents will benefit due to the reduced emergency response and clean-up costs, and reduced loss of function. Statewide, the Sacramento – San Joaquin Bay-Delta will benefit from reduced floodwater related trash and pollutant loading.

**Table 3. Project Beneficiaries Summary**

<b>Local</b>	<b>Regional</b>	<b>Statewide</b>
Residents and workers in this DAC within the City of Antioch	City of Antioch	<b><i>Bay-Delta</i></b>

### ***Timing of Benefits***

Installation of the culverts will be completed by 2013. For this analysis, a 50-year useful project life is assumed, thus benefits and costs are calculated through 2063 (50 years after the project comes online).

### ***Uncertainty of Benefits***

This analysis of costs and benefits is based on available data and some assumptions. As a result, there may be some omissions, uncertainties, and possible biases. In most cases, omissions lead to a downward bias in benefits. These issues are listed in Table 4

**Table 4. Omissions, Biases, and Uncertainties, and Their Effect on the Project**

<b>Benefit or Cost Category</b>	<b>Likely Impact on Net Benefits*</b>	<b>Comment</b>
Improved Surface Water Quality	U	Quantification of water quality impairments that result from flooding is not available. The improvements in surface water quality will likely vary depending on the severity of flooding.
Avoided Loss of Recreation	+	Additional recreation may be lost due to flooding. For example, recreation that occurs in street areas (bike riding, running and other sports) will be lost during flooding events.

\*Direction and magnitude of effect on net benefits:

+ = Likely to increase net benefits relative to quantified estimates.

++ = Likely to increase net benefits significantly.

- = Likely to decrease benefits.

-- = Likely to decrease net benefits significantly.

U = Uncertain, could be + or -.

***Potential Adverse Effects***

Adverse effects caused by this project are expected to be limited to temporary construction impacts.

**Documents Supporting Benefits Analysis**

The following references were used to develop the cost and benefit analyses described in this section:

- Personal communication with Phil Harrington, Director of Capital Improvements/Water Rights, City of Antioch (12/16/2010).
- State of California. *San Francisco Bay Basin Water Quality Control Plan (Basin Plan)*. Oakland, CA: RWQCB, 2007. Web. 24 Dec 2010.

**Economic Benefit Tables**

No water quality and other benefits generated by this project have been quantified; as a result, Table 19 has been excluded.

**Table 19: Water Quality and Other Expected Benefits  
Drainage Area 55 – West Antioch Creek Channel Improvements Project**

NOT APPLICABLE